

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

FEE TRANSMITTAL
for FY 2002

Patent fees are subject to annual revision.

TOTAL AMOUNT OF PAYMENT (\$) **780.00****Complete if Known**

Application Number	
Filing Date	
First Named Inventor	STARR, Donald
Examiner Name	W.D. Bray
Group Art Unit	3725
Attorney Docket No.	W141 0235

METHOD OF PAYMENT

1. ☒ The Commissioner is hereby authorized to charge indicated fees and credit any overpayments to:
- Deposit Account Number **02-1037**
- Deposit Account Name **Oyen Wiggs Green & Mutala**
- ☒ Charge Any Additional Fee Required Under 37 CFR 1.16 and 1.17
- ☐ Applicant claims small entity status. See 37 CFR 1.27
2. ☒ **Payment Enclosed:**
- ☒ Check ☐ Credit card ☐ Money Order ☐ Other

FEE CALCULATION**1. BASIC FILING FEE**

Large Entity Code (\$)	Small Entity Code (\$)	Fee Description	Fee Paid
101 740	201 370	Utility filing fee	740.00
106 330	206 165	Design filing fee	
107 510	207 255	Plant filing fee	
108 740	208 370	Reissue filing fee	
114 160	214 80	Provisional filing fee	

SUBTOTAL (1) (\$) **740.00****2. EXTRA CLAIM FEES**

Total Claims	Extra Claims	Fee from below	Fee Paid
8	-20** =		
2	-3** =		
Multiple Dependent			

Large Entity Code (\$)	Small Entity Code (\$)	Fee Description	Fee Paid
103 18	203 9	Claims in excess of 20	
102 84	202 42	Independent claims in excess of 3	
104 280	204 140	Multiple dependent claim, if not paid	
109 84	209 42	** Reissue independent claims over original patent	
110 18	210 9	** Reissue claims in excess of 20 and over original patent	

SUBTOTAL (2) (\$) **0.00**

**or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)**3. ADDITIONAL FEES**

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
105 130	205 65	Surcharge - late filing fee or oath	
127 50	227 25	Surcharge - late provisional filing fee or cover sheet	
139 130	139 130	Non-English specification	
147 2,520	147 2,520	For filing a request for <i>ex parte</i> reexamination	
112 920*	112 920*	Requesting publication of SIR prior to Examiner action	
113 1,840*	113 1,840*	Requesting publication of SIR after Examiner action	
115 110	215 55	Extension for reply within first month	
116 400	216 200	Extension for reply within second month	
117 920	217 460	Extension for reply within third month	
118 1,440	218 720	Extension for reply within fourth month	
128 1,960	228 980	Extension for reply within fifth month	
119 320	219 160	Notice of Appeal	
120 320	220 160	Filing a brief in support of an appeal	
121 280	221 140	Request for oral hearing	
138 1,510	138 1,510	Petition to institute a public use proceeding	
140 110	240 55	Petition to revive - unavoidable	
141 1,280	241 640	Petition to revive - unintentional	
142 1,280	242 640	Utility issue fee (or reissue)	
143 460	243 230	Design issue fee	
144 620	244 310	Plant issue fee	
122 130	122 130	Petitions to the Commissioner	
123 50	123 50	Processing fee under 37 CFR 1.17(q)	
126 180	126 180	Submission of Information Disclosure Stmt	
581 40	581 40	Recording each patent assignment per property (times number of properties)	40.00
146 740	246 370	Filing a submission after final rejection (37 CFR § 1.129(a))	
149 740	249 370	For each additional invention to be examined (37 CFR § 1.129(b))	
179 740	279 370	Request for Continued Examination (RCE)	
169 900	169 900	Request for expedited examination of a design application	

Other fee (specify) _____

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) (\$) **40.00****SUBMITTED BY**

Name (Print/Type) **Gerald O.S. Oyen**

Signature 

Registration No. **27,280**

(Attorney/Agent)

Complete (if applicable)

Telephone **(604) 669-3432**

Date **10/10/2002**

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

U.S. Patent No. 5,119,930, granted June 9, 1992, Stelter, discloses
35 and protects a single quadrant-type log sorter. Stelter, in Figures 1 and 2, illus-
trates in dotted lines, a counterweight 70 which reduces the force necessary to raise
the quadrant 16. Stelter also discusses at column 4, lines 53-56, the use of a
double-acting cylinder 56 so pressure may be provided on both sides of a piston to

raise and lower the quadrant and rectify a portion of the live load. Stelter does not, however, disclose dual quadrants.

U.S. Patent No. 5,722,475, granted March 3, 1998, Lammi,
5 discloses a design of ring type debarker using rotary cutting heads 23. The ring or
rotor 4 can be varied in speed, as stated in the abstract, and in column 2, lines 60-
63. The speed of the rotor disk 4 can be adjusted continuously due to variations in
log diameter, surface finish, irregularities and the like. It is mentioned in column
2, lines 64-67, that the rotational speed of the cutting head should be kept nearly
10 constant regardless of variations in the rotor speed. Lammi therefore does not
disclose variable ring or rotor speed or variable force on the cutting blades.

U.S. Patent No. 4,609,020, granted September 2, 1986, Hutson, is
one of several Hutson patents which disclose a log debarker system which has a
15 rotor assembly 26 which uses a plurality of debarking tools 28 (knives), the
combination rotating in a rotor housing assembly 24. There is no mention of
varying the force on the debarking tools 28 or rotor or log feed speed as a function
of diameter.

U.S. Patent No. 5,117,881, granted June 2, 1992, Simpson, assigned
20 to Nicholson Manufacturing Company, discloses a ring type debarking apparatus
which includes counterbalance weights 64 for rotary cutters 22. The counterbalance
weights 64 offset centrifugal and gravitational forces. The debarker also includes
rotary cutting units 18 on ends of swing arms 24. The debarker ring 22 rotates (see
25 column 2, lines 8-9) but presumably at a constant speed. There is no mention of
varying ring speed, tool tip force or log feed speed as a function of log diameter.

U.S. Patent No. 4,330,019, granted May 18, 1982, Murphy et al.,
discloses a sawmill for cutting logs into lengths which allows for maximum use of
30 the wood. An electronic scanner surveys the log as it is delivered to a support and
obtains log profile data which is transmitted to a computer. Signals sent by the
computer to each of the saws cause the saws to take up positions which ensure that
the log is cut into optimum random lengths. The Murphy et al. system utilizes a
reference datum line or cutting plane (see column 1, lines 55-56) for positioning the
35 log. Murphy et al. disclose a "reach out" cylinder 126 and an end plate, but these
are used to assess the position of the butt end of the log and do not push the log into
any particular position. The log therefore remains in its initial rest position.

Murphy et al. also disclose a scanner 100 which may use conventional single or double axis techniques for scanning (see column 4, lines 28-29) as well as a master control unit 110.

5 U.S. Patent No. 4,468,993, granted September 4, 1984, McCown et al., discloses a log bucking station in which a log is scanned to determine its size and shape. The scan data is analyzed by a computer which determines the optimum locations for cuts on the log. The proposed cut locations are optically displayed on the log by a laser for inspection by the operator. The operator can overrule the
10 computer. McCown et al. permit the distance between the pairs of saws to be varied because the saws run on tracks. By varying the distance between the two travelling saws 26 and 28, it is said that it is possible to optimize the saw cut locations.

15 SUMMARY OF INVENTION

The present invention overcomes or greatly reduces the disadvantages of known systems for processing raw logs into debarked random cut lengths prior to delivery of the logs to a chipping or log sawing apparatus.

20

The invention is directed to a log processing and cutting system comprising: (a) a log infeed deck; (b) a log feeder; (c) a dual quadrant singulator located downstream of the log feeder; (d) an infeed conveyor; (e) a log barker located downstream of the barker infeed conveyor; (f) a barker outfeed conveyor
25 located downstream of the log debarker; (g) a bucking line scanner which scans the debarked log and by means of an associated computer, determines the log profile of the debarked log and determines optimum cutting locations on the log; (h) a conveyor located downstream of the bucking line scanner for conveying the scanned log to a bucking line; (i) a cradle in which the scanned log is held; (j) a bucking line
30 positioner which contacts an end of the scanned log and moves it to an optimum position for cutting by a cut-off saw; (k) a bucking line cut-off saw which cuts the log at the optimum location determined by the computer from the log profile information ascertained by the scanner; (l) a bucking line outfeed conveyor located downstream of the cut-off saw for conveying away the cut log; and (m) a log sorter
35 which directs the cut log to a log sorting station.

The dual quadrant singulator can comprise a lower quadrant singulator and an upper quadrant singulator, the pair of singulators operating in combination to single out and elevate individual logs.

5 The debarker can incorporate rotating rings, which can hold debarking knives and the force exerted on the cutting knives and the speed of rotation of the rings can be varied according to log profile characteristics of an individual log. The bucking line scanner can determine the log profile by three laser scans, to determine the volume and shape of the log being scanned at incremental log lengths.

10 The computer can instruct the cut-off saw to move in advance of the log reaching the cradle in order to minimize saw travel during the log cutting operation. The log positioner can comprise a hydraulic piston and cylinder, the piston extending a specified distance as determined by the computer, based on log
15 profile and volume data as determined by the log scanner, and thereby positioning the log in optimum position.

 The system can include a pair of spaced apart cut-off saws, the locations of the pair of cut-off saws being variable according to optimum saw
20 location cut points on the log to be cut, as determined by the computer based on log scan data determined by the scanner.

 The invention is also directed to a method of processing and cutting logs comprising: (a) singulating logs using a dual quadrant singulator; (b) debarking the logs using a variable speed ring and knife system; (c) scanning the debarked
25 log by means of an associated computer, which determines the log profile of the debarked log and determines optimum cutting locations on the log; (d) conveying the scanned log to a bucking line cradle; (e) using a bucking line positioner which contacts an end of the scanned log and moves it to an optimum position for cutting;
30 (f) cutting the log at the optimum locations as determined by the computer from the log profile information ascertained by the scanner and according to the positioner; (g) conveying the cut log away from the cutting area; and (h) sorting the cut log according to a command from the computer.

35 The dual quadrant singulator can comprise a lower quadrant singulator which can lift the log to a first elevation and an upper quadrant singulator, which can lift the log to a second elevation. The rotating rings of the

debarker can hold cutting knives and the force exerted by the cutting knives on the log and the speed of rotation of the rings can be varied according to log profile characteristics of an individual log.

5 The scanning of the log can be done by three laser scans, which determine the volume and shape of the log being scanned at incremental log lengths. A computer can command a saw to move in advance of the log reaching the cradle to thereby minimize saw travel during the log cutting operation. The log can be positioned in the cradle by a piston which can extend a specified distance as
10 determined by the computer, based on log profile and volume data as determined by the log scanner, and thereby positioning the log in optimum position. The log can be cut at two locations, the locations of the cuts being determined as optimum by the computer based on log scan data ascertained by the scanner.

15 BRIEF DESCRIPTION OF DRAWINGS

 In drawings which illustrate specific embodiments of the invention, but which should not be construed as restricting the spirit or scope of the invention in any way:

20

 Figure 1 is a schematic plan of the log processing mill showing the general arrangement and sequence of the log processing equipment and process.

 Figure 2 is a detail schematic plan of the quadrant/barker area
25 showing the general arrangement of the log singulating and debarking equipment.

 Figure 3 is an end elevation of the dual log quadrant feeder.

 Figure 4 is a schematic plan of the cut-off-saw bucking area showing
30 the general arrangement of the log handling, sawing and cut log conveying and sorting equipment.

 Figure 5 is an end elevation of the cut-off saw and log bucking
35 cradle.

 Figures 6a, 6b and 6c are plan, side and end elevations of the cut-off saw area log positioner.

Figure 7 is an end section view of the raw log collecting and dual quadrant area, taken along section line 1 of Figure 1.

Figure 8 is an end section view of the dual side by side log barkers,
5 taken along section line 2 of Figure 1.

Figure 9 is an end section view of the dual and cut log take away deck, taken along section line 3 of Figure 1.

10 Figure 10 is a schematic of the computer monitor display showing scanned log profile form the scanner.

Figure 11 is a schematic of the computer monitor display showing variables of the log bucking system.

15

DETAILED DESCRIPTION OF SPECIFIC
EMBODIMENTS OF THE LOG PROCESSING MILL

A log handling and cutting system which cuts logs into lengths, and
20 allows for maximum use of fiber is disclosed. The system includes equipment for singulating the logs, optimally removing the bark from the logs, scanning the true log image, cutting the logs to length, and sorting the cut logs arranged in a sequence of coupled operations. The logs are singulated using a dual quadrant singulation system to provide maximum singulation reliability, thereby allowing a
25 single operator to attend to this process. Once singulated, the logs are fed automatically into a debarker where the diameter and volume are scanned and debarker-operating parameters are set for optimum bark removal. The log is then scanned, tree length, using a unique scanning system, which determines the true image of the log. This enables the determination by computer of the optimum bucking solution
30 of the log as well as a proper sorting of the optimum random lengths. The saws are adjusted in response to the computer solution and the log is positioned by a positioner according to a computer generated reference datum. This results in the log being positioned for cutting to the optimum random lengths. A command signal is sent from the computer to the log sorting system, which tracks the position of the
35 random lengths and allows them to be sorted to the appropriate sort storage bin.

This subject invention optimizes the debarking of the logs by using input variables of log diameter, tool overlap, tool speed (SFPM - surface feet per minute), and required tool tip force to determine the debarker feedspeed, debarker ring RPM and the applied pressure to the debarker tools (PSI). The applied
5 pressure calculation takes into account the effects of centripetal acceleration on the tool arms at a given log diameter to ensure that the correct and optimum pressure is applied to debarking tools.

In the system according to the invention, the logs are first singulated
10 from a log pile using a dual quadrant feed arrangement which enables high log handling rates with minimal intervention by an attendant. Once singulated, the log is fed automatically in a variable speed ring style debarker where log diameter information is collected and the debarking procedure is optimized for tool overlap, feedspeed, ring RPM, and tool pressure. This combination minimizes cutting
15 overlap and wasted white wood. This debarking process is adjusted dynamically by a computer as the log diameter is changed down the log length (since logs are not perfect cylinders). After debarking, the log is scanned over its entire tree length on a belt with a triple combination scanner. This scanner system calculates the log length, log volume and the true shape cross-section of the log down its length
20 thereby generating a true shape image of the log. This data includes sweep, taper, crooks and other log imperfections. This data is then transmitted to an optimizing computer, which rapidly analyzes the data and determines the optimum cut locations. The debarked and scanned log is then transferred transversely to a queuing cradle and then into a cut cradle. As soon as the log reaches the cut cradle, a
25 unique log positioner locates the end of the log in relation to the moveable saw positions and pushes the log into optimum position for cutting. Once the log is cut, the cut portions are taken away and the saws are able to move to their next required position, while a new log is being transferred to the cut cradle. The log that has been cut into sections is unloaded onto a conveyor belt and is transferred to the cut
30 piece sorting area. While this transfer is being performed, the new log is being cut. This overlap of infeed, cutting and outfeed cycles reduces log handling time and allows a smooth and efficient process to be performed in the log cut-off saw area of the system.

35 Referring to the drawings, Figure 1 illustrates a schematic plan of the overall log processing system and equipment including the general arrangement and sequence of the log processing equipment from the raw log collection area to the